# sPHENIX TPC Mechanical Design

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*for the sPHENIX Collaboration*

## Abstract

The sPHENIX experiments will explore the properties of the quark gluon plasma via measurements of jets and upsilons. sPHENIX will feature a state of the art tracking system which consists of a highly granular silicon pixel detector (MAPS), a silicon strip detector (INTT) and a time projection chamber (TPC). The tracking system will work in continuous read out, at high data collection rates -15kHz- and will be able to provide momentum resolution below 2% at 5 GeV/c, which is suitable for upsilon reconstruction. The TPC will span a radius from 20 to 78 cm and 2.2 units in pseudorapidity, smaller than TPCs used in current heavy ion experiments, and will be exposed to high electric and magnetic fields. The strategy for its construction, mechanical specifications and progress of the outer field cage construction will be shown in this poster.

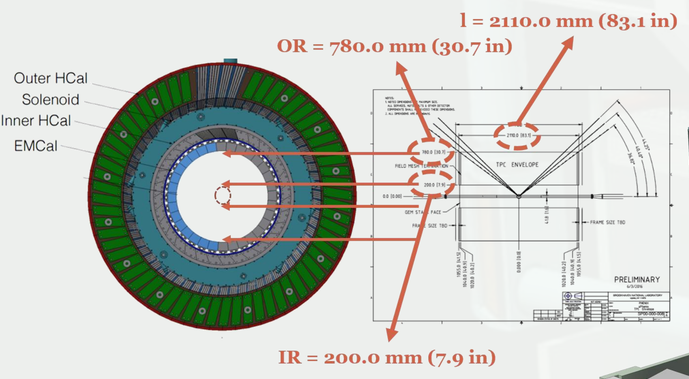
## Summary

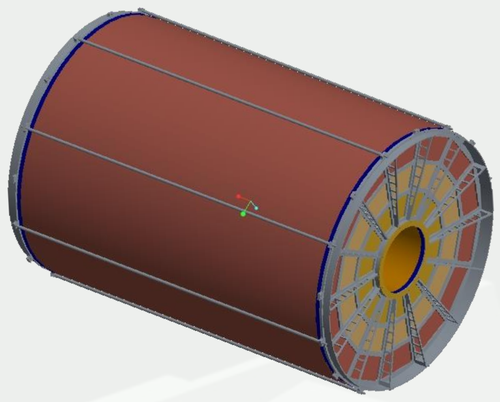
- Mechanical design for an sPHENIX-TPC
  - Hybrid of STAR/ILD design
- Design
  - Lightweight
  - Robust
  - Allows for straightforward production
  - Design well advanced
- Prototyping in progress

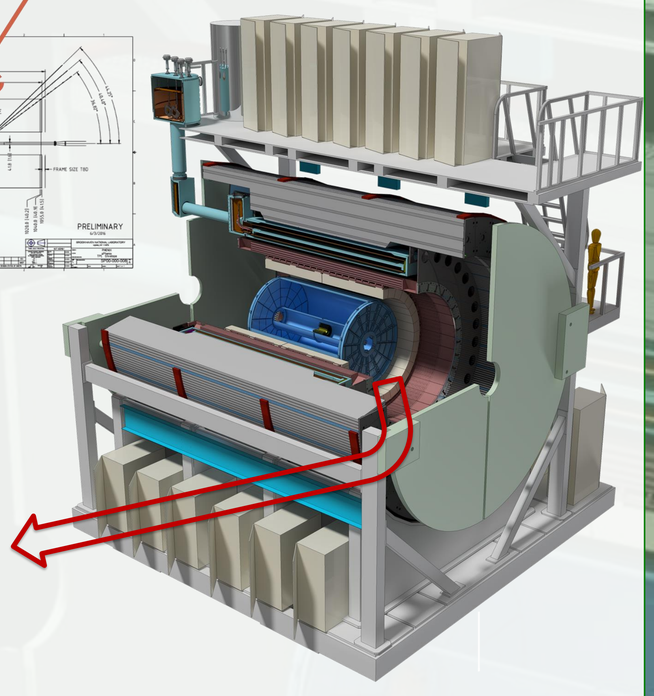
See also

- R&D Studies for the sPHENIX Time Projection Chamber, Prakhar Garg (SBU) http://indico.cern.ch/event/433345/contributions/2358223/
- Design of the sPHENIX tracker, Sourav Tarafdar (VU) http://indico.cern.ch/event/433345/contributions/2358220/

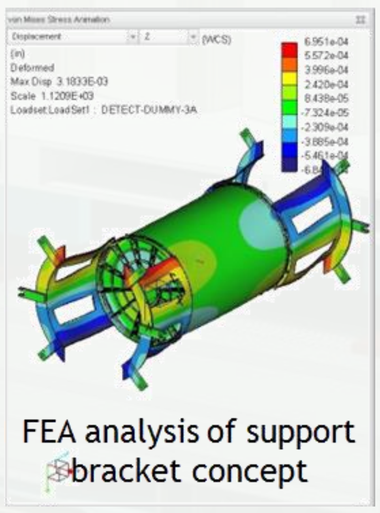
## sPHENIX and the Time Projection Chamber



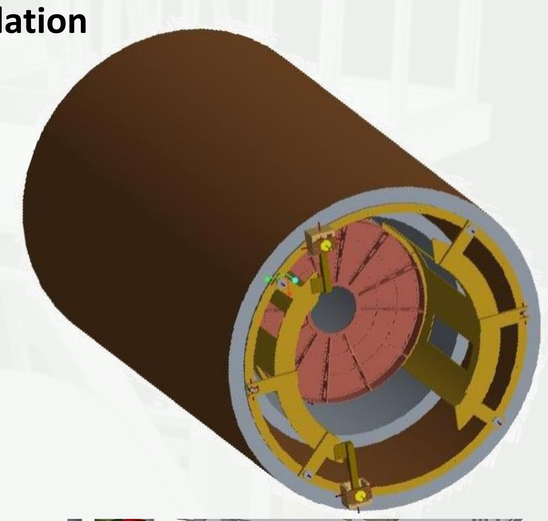


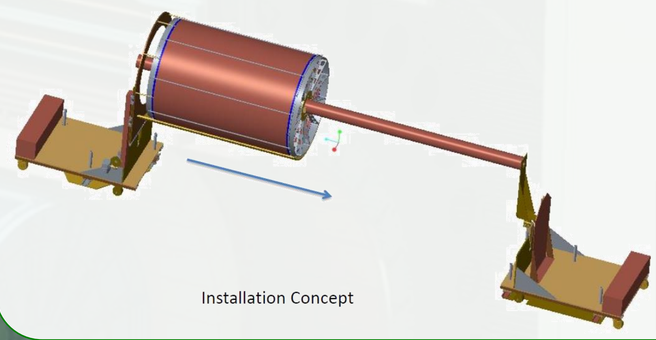
## TPC Installation



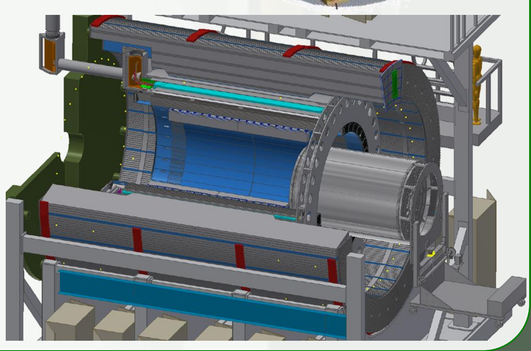

FEA analysis of support bracket concept

PC supported by HCal





Installation Concept



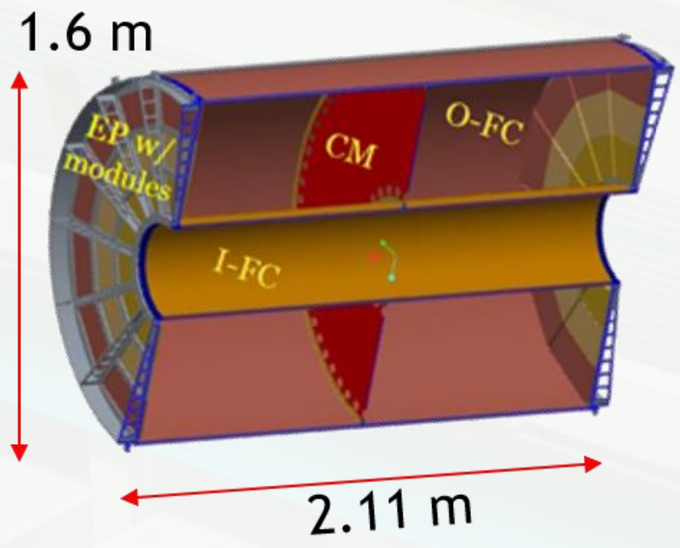
## TPC Mechanical Structure

- Field Cage (FC)
- Endplate (EP)
  - Modules
  - Electronics
- Central Membrane (CM)
- Readout Electronics

Field Cage subdivided in

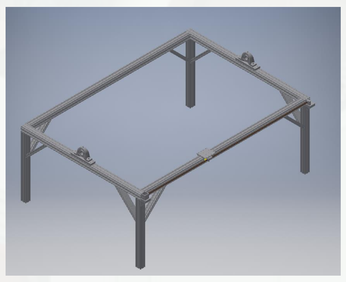
Outer (O-FC)

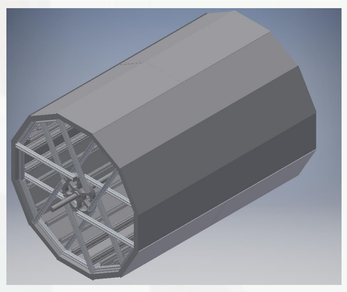
Inner (I-FC)




## TPC Production & Assembly

Home made mandrel



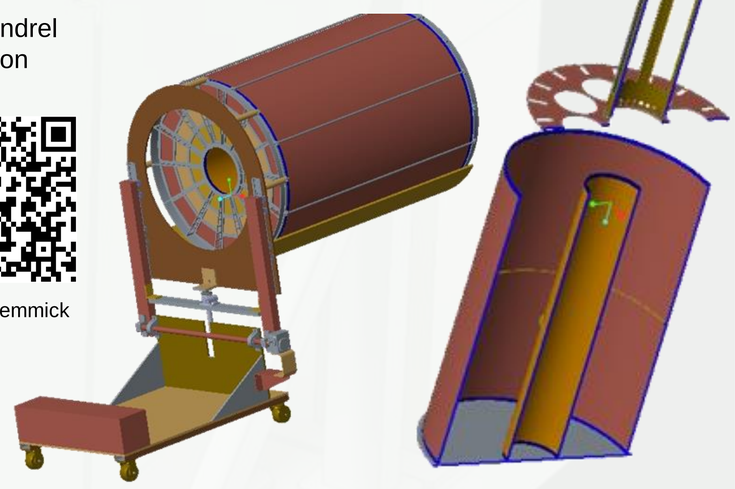


See mandrel in action

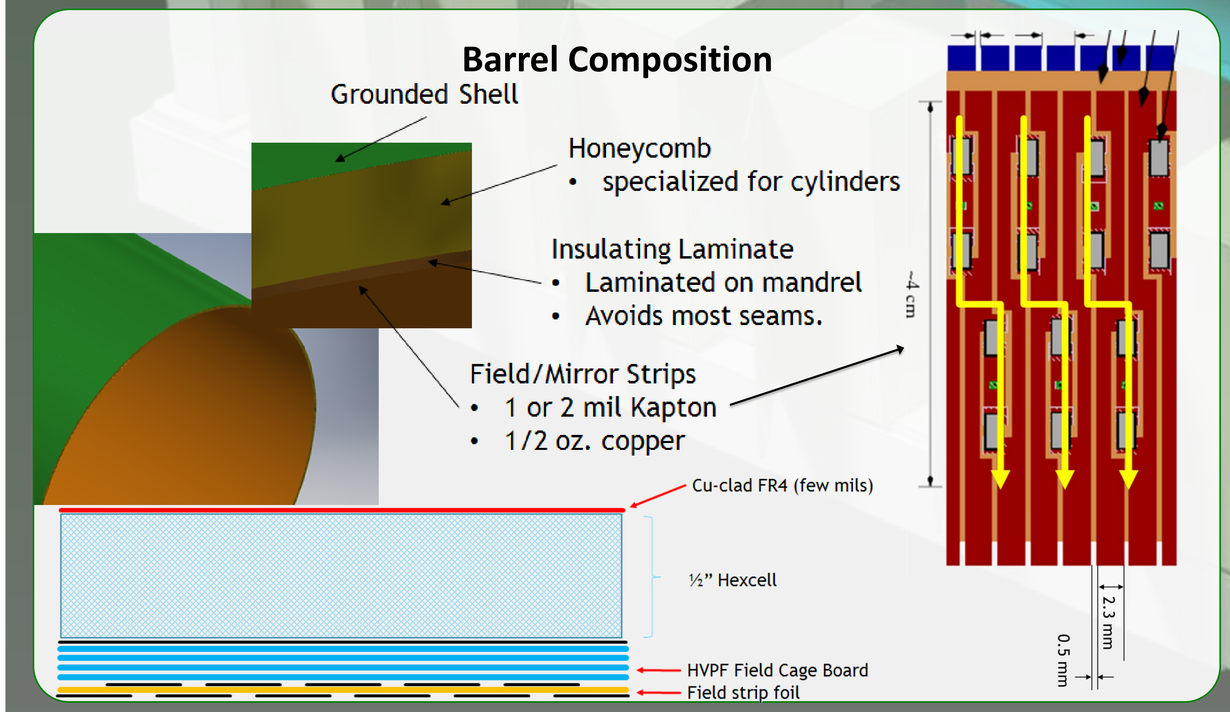
by T. K. Hemmick

Outer field cage and endplate

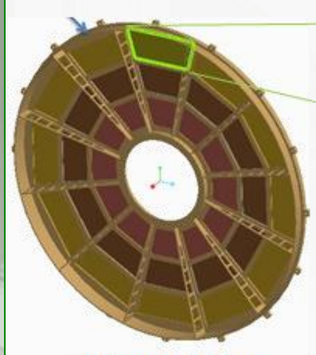
Central membrane



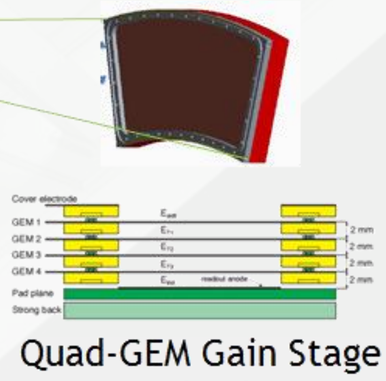
## Barrel Composition



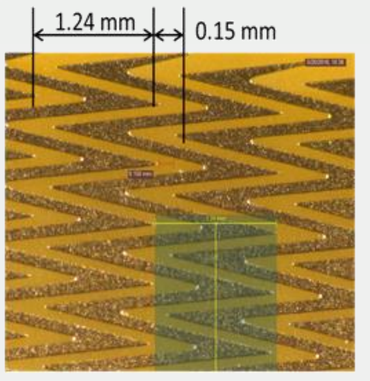

## Endplate and Readout



72 modules
2(z), 12(ϕ), 3(r)




Quad-GEM Gain Stage
Operated @ low IBF




ACE Board #2 Left
Interleaving: 1-(0.15/2)/1.24=**94%**
Copper thickness: 9 µm (1/4 oz)

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